

Reclaiming Public Realm to Improve Human Health and Environment in Indian Cities:

Shaping ideas of public realm conducive to non- motorized modes of travel

The background of the slide is a painting titled "A Cloudy Day. Calcutta" by Arup Lodh. It depicts a busy street scene in Calcutta. In the foreground, a tram is moving along the tracks, with several cars and pedestrians around it. The street is wet, reflecting the lights. In the background, a tall chimney is visible against a cloudy sky. The overall atmosphere is hazy and urban.

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By Florina Dutt (Master of City & Regional Planning, 2016)

"A Cloudy Day. Calcutta, painting by : Arup Lodh" (Source: <https://artistportfoliomagazine.wordpress.com/2014/09/24/arup-lodh-yolaine-vincent-lerone-wilson-cover-art-exhibition/>)

Webpage: <http://www.publicrealm-cgis.com/>

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I am grateful to my family for their constant support in my academic endeavor.

¹ <http://www.ihdindia.org/urbandevconference/Concept-Note-UrbanDevConf-edited.pdf>

² http://trg-india.org/trg_conference_2015

Contents

Abstract.....	7
1. Introduction.....	8
1.1. Public Realm Definition	8
1.2. Public Realm, its impact on Environment and Health	9
1.3. Streets as Public Realm in Indian Cities.....	10
1.4. Influence of Neoliberalism on Public Realm in Indian Cities.....	11
2. Impact of current conditions in Indian cities.....	14
2.1. Congestion.....	14
2.2. Impact on Health and Environment.....	15
2.3. Fatalities from road accidents	17
3. Why non-motorized modes of travel should be encouraged in Indian cities?.....	18
3.1. Mobility v. Accessibility	18
3.2. Socioeconomic Factors in Indian cities	19
4. Global Example Case Studies.....	21
4.1. United States.....	21
4.2. Shanghai, China.....	22
4.3. Seoul, Korea.....	24
4.4. Tokyo, Japan.....	25
5. Possibilities of Transformation in Indian Cities.....	28
5.1. Public Realm Development Plans in the Cities	28
5.2. Events and Awareness programs.....	29
6. Case Study in Kolkata.....	31
6.1. Site selection:	31
6.2. Street Typologies studied.....	31
6.3. Design Strategies.....	33
7. Existing conditions study and Recommended Design Strategies	35
7.1. Type 1 & Type 2 Roads – Gariahat Road and Rashbihari Avenue Intersection	35
7.1.1. Characteristics of Gariahat and Rashbihari Avenue.....	35

7.1.2. Redesign Strategies [A]; Reprogrammed as major two-way streets with segregated bike lanes and vehicular lanes.....	36
7.2. Type 3 Roads – Golpark.....	38
7.2.1. Characteristics of Golpark Circular Intersection	38
7.2.2. Redesign Strategies [A]; Reprogrammed as two-way streets, with segregated bike lanes, and vehicular lane.....	39
7.3. Type 4 Roads – Intersection of Prince Anwar Shah Road & Raja Subodh Chandra Mullick Road.....	41
7.3.1. Characteristics of Prince Anwar Shah (PAS) and Raja Subodh Chandra Mullick (RSCM) Road.....	41
7.3.1. Redesign Strategies [B]; Reprogrammed as two-way streets with bus only lane and segregated bike lanes	41
7.4. Type 5 Roads- Jodhpur Park neighborhood (Narrow streets with disproportionate land use and density for two – way lanes).....	44
7.4.1. Characteristics of Jodhpur Park neighborhood streets with intermittent heavy traffic	44
7.4.2. Redesign Strategies [C]; Reprogrammed as one-way streets.....	44
7.5. Type 6 Roads- Jodhpur Park neighborhoods (residential streets and streets with less traffic load).....	46
7.5.1. Characteristics of Jodhpur Park neighborhood residential streets	46
7.5.1. Redesign Strategy [D] Reprogrammed as limited traffic streets with two way bike lanes.....	47
8. Conclusion.....	49
8.1 Limitations in implementing public realm changes in Indian cities	49
8.1.1. Design Challenges.....	49
8.1.2. Politics.....	49
8.1.3. Economics.....	50
8.1.4. Public Acceptance.....	50
8.2 Role of Planner	50
9. Reference.....	52

Content of Figures and Tables

Figure 1. Typical Street life in India depicting activities and cultural exchange.....	11
Figure 2. Packed Delhi-Gurgaon Highway on massive power outage on, July 31 2012 (Source: Times Union)	12
Figure 3. Comparison of macroscopic flow density phase paths for Yokohama, Nairobi, and San Francisco (Arnott, 2015; Daganzo F.C, 2008)	15
Figure 4. Top 20 cities in the world with highest level of PM2.5 (Source WHO Report 2014)..	16
Figure 5. Commuters masked against air pollution negotiating city traffic. Mumbai, India (Source http://www.vox.com/2015/2/24/8094597/india-air-pollution-deaths)	16
Figure 6. Bar Graphs showing Deaths due to Road Accident (left) and total number of road accidents in different States(right) (Data source, Road Ministry , Save LIFE Foundation Visualization . Quart.com)	17
Figure 7. Transportation - land use interaction: empirical finding in North America and implication (Badoe A.D, 2000)	19
Figure 8 Mode Share in different cities in India (City population in Million),(left) Average trip length in Indian Cities, (right) (Tiwari 2011)	20
Figure 9 Complete Street Initiatives in United States (Source : National Complete Street Coalition).....	21
Figure 10. Bund Before (1950) and After (2010)	23
Figure 11.Different transportation modes are provided with pedestrian friendly and bike friendly infrastructure (China)	24
Figure 12.Cheong GyeCheon Redevelopment in South Korea (Before and after).....	25
Figure 13. Bike lanes in Yamate Dori, Tokyo Japan (Source : http://www.tokyobybike.com/2014/09/tokyo-bicycle-lane-designs.html)	26
Figure 14. Sabarmati Riverfront Development Plan, Ahmedabad (source http://www.sabarmatiriverfront.com/)	29
Figure 15 Raahgiri Day ,a public response in Gurgaon New Delhi to the social, economic and spatial need of the community (source: www.pps.org)	29
Figure 16. Happy Park Street in Kolkata (Source: Fliker.com)	30
Figure 17. Map of South Kolkata showing planning range and types of roads categorized; numbers on the map are associated with road types mentioned in this section	32
Figure 18. Planning range map showing design strategies associated with each type of roads; numbers on the road are associated with the types of road mentioned in section 6.2	33
Figure 19. Photographs showing Gariahat Road and Rashbihari Avenue intersection, the overpass along Gariahat Road and the tram track along Rashbihari Avenue.....	36
Figure 20. Redesign Strategy [A], showing the suggested changes for Gariahat and Rash Bihari Road Crossing.....	37
Figure 21 Redesign Strategy [A] showing suggested changes under the bridge and on Gariahat Road	37

Figure 22. Pictures of Golpark Circular Intersection.....	38
Figure 23. Redesign Strategy [A], showing suggested changes in the Golpark round about, proposed two-way continuous bike lane, and pedestrian connections highlighted	40
Figure 24. Redesign Strategy [A], Showing eye level view of Golpark highlighting the continuous two-way bike lane, landscape buffer and corner open space integrated to sidewalks	40
Figure 25. Pictures of Prince Anwar Shah and Raja Subodh Chandra Mullick Road Crossing	41
Figure 26. Pictures of Prince Anwar Shah Road in front of South City Mall	42
Figure 27. Redesign Strategy [B], Showing Prince Anwar Shah and Raja Subodh Chandra Mullick Road intersection, Right of way for segregated two way bike lane, segregated bus and car lanes, other improvements such as designated taxi stops and bus stops aims to facilitate pedestrian movement at this busy street intersection	43
Figure 28. Redesign Strategy [B], Showing segregated two –way bike lane in front of South City Mall, unified sidewalks with building setbacks allowing that can hold spillover	43
Figure 29. Pictures showing Jodhpur park Neighborhood Streets, with intermittent heavy traffic at times freight traffic that interfere with road safety and preserving residential neighborhood character ,	44
Figure 30. Redesign Strategy [C], Showing proposed one-way Streets in Jodhpur Park neighborhood with two-way bike lanes, wider sidewalks and intersection with paved pedestrian walkway on the assigned limited traffic streets.....	45
Figure 31. Redesign Strategy[C], showing assigned one way street, improved wider sidewalks , two-way bike lanes, and street furnishing	46
Figure 32. Pictures showing narrow streets in Jodhpur Park neighborhood, with bicyclist, pedestrians and two wheelers.....	47
Figure 33. Redesign Strategy [D], Showing some streets in the neighborhood that are assigned limited traffic streets that would encourage people to walk and bike.....	48
Figure 34. Redesign Strategy [D], Showing improved crossing for pedestrians and bicyclists, two- way bike lanes and bike share facilities.....	48
 Table 1. Road typologies and corresponding redesign strategies	35

Reclaiming Public Realm to Improve Human Health and Environment in Indian Cities:

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Abstract

This study examines how the public realm can be redesigned to improve human health and environmental conditions in Indian cities. Indian streets have traditionally been a significant part of its public realm as they were the primary places to congregate, celebrate, and interact (Fyfe, 1998). Yet, in the past two decades, rapid increase in vehicular traffic have crowded out most forms of non-motorized human activity on public roads. The high levels of congestion and pollution from vehicles are engendering serious human health hazards. This paper first describes how the growth of private automobiles in past few decades have intensified the environmental challenges in Indian cities. It then argues that the control of vehicular traffic together with the promotion of walking and non-motorized transportation are essential for improving human health and the public realm in Indian cities. The paper then outlines potential design strategies for integrating walkability and bikability in different types of streets through global examples and case studies. Finally, a key commercial and residential area of South Kolkata is chosen as a case for examining the principles outlined through a redesign of its street network to improve walkability and bikability that could serve as an example for similar urban transformations in other Indian cities.

Keywords: Public realm, congestion, human health and environment, mobility, accessibility, congestion, fatality, complete street, non-motorized transport (NMT), bikability, walkability, bike lanes, public right of way

1. Introduction

1.1. Public Realm Definition

Public realm has been defined variously in the literature. Richard Sennett describes it as a place where strangers meet (Sennett, 2014). Sennett explains the difference between public and private is in the amount of knowledge, a group or a person has about others. In a private realm, people know each other well whereas in public realm people does not know each other. He emphasizes that strangers meeting at a place enable a certain type of activities which cannot happen in a private realm. Jurgen Habermas's idea of public realm took a step forward beyond physical nature of the public realm.³ According to him "public realm" and "public space" embrace any medium, occasion or event, which promotes open communication between strangers.

In law, public-private distinction has been viewed as an outcome of the coercive power gain of private institutions that was formerly reserved by the government (Horwitz, 1982). From a social policy standpoint, John Clarke stated, the development of the idea of public realm was one the defining features of Western capitalist democracies, although they are the site for political –cultural investment and, attachments. The significant takeaway is the two issues, identified by Clarke. First, public realm require political-cultural work to make them fruitful and second, the need to overcome resistance, refusals, and blockages in the process of executing the strategies to make public realm successful places (Clarke, 2004).

Although the idea of public realm includes a wide range of concepts yet a common thread that ties them, is the idea of space for positive interaction between strangers. In popular literature public realm is often defined as publicly owned streets, pathways, the right of ways, parks, public accessible open spaces and any public or civic buildings⁴. It provides space for interaction, the quality that is otherwise absent in a private realm. Essentially, the public realm is accessible to all. This paper investigates how public realm is effective in

³ <http://www.richardsennett.com/site/senn/templates/general2.aspx?pageid=16&cc=gb>

⁴ <http://www.arc-online.co.uk/retrieve/1f15634e6eb30954ca9c0d6acb1bed67>

impacting public health and overall environment of cities and if there are means to improve their performance through redesign.

1.2. Public Realm, its impact on Environment and Health

It is not unfamiliar that places and qualities of place are significant determinants of human health. Hippocrates, twenty-five centuries ago identified in his essays “Air, Water, and Places” the character of healthy places as sunny, breezy hillsides. He emphasized on the quality of air and water resources as key determinants of human health. In the 19th century, Fredric Law Olmstead placed human health as a priority in his place making and design strategies. Half a Century ago *American Public Health Association* issued standards for site selection, sanitary infrastructure, landscape design, street layouts as well as other amenities to design communities. Today, with the invention of technology and changing lifestyle of people, the challenges are different. Societies are becoming highly mobile and questioning, how the design of built environment and public places may have real public health impact value (Frumkin, 2003). Dan Burden’s Street Design Guidelines for Healthy Neighborhoods typically recommends narrower streets, with traffic calming strategies, sidewalks with sufficient buffer. His design guidelines and strategies emphasize on continuity and connectivity; safer crosswalks and bicycle lanes (Burden, 1999).

In United States as well as other countries environmental pollution is a well-recognized cause of human ailments. Increased level of automobile use and air pollution is associated with Sprawl (Ewing.R, 2003; Frank D.L 2001) .A quarter of the CO₂ emission from global energy use comes from transport of which three-quarter are road traffic (Woodcock], 2009). Such alarming rate off air pollution is responsible for Asthma and other fatal respiratory diseases.

Reduced physical activity such as walking and increased reliance on automobiles is the reason for chronic health disorders such as obesity and diabetes. Regular physical activity and an active lifestyle have proven beneficial for public health over time. Design characteristic of communities such as proximity to recreation facilities, street design, accommodation of safe pedestrian movement, bicycle, and wheelchair, play a significant role

in promoting or discouraging regular physical activity of an Individual (Dannenberg L.A, 2003).

Also, the disruption of green land and natural vegetation due to fast paced urban growth reduced infiltration capacity of the ground. The runoff from impervious surfaces layered with pollutants reduces water quality. Such pollutants increase the levels of bacterial and chemical contaminants of water supply source. Water pollution is a major cause of gastrointestinal diseases along with other health issues (Dannenberg L.A, 2003) As such maintaining parks and open spaces, restoring adequate tree and grass cover in the urban neighborhoods through public realm improvements is of extreme importance.

1.3. Streets as Public Realm in Indian Cities

Streets in Indian cities are active domains for social interaction. They are an interface for cultural and commercial exchange. Traditionally, streets have been used as marketplaces, festival venues, space for local sports and other leisure activities. Indian communities and cities inherently valued public interaction, and streets have been a major vessel of such activities. Ranging from religious festivals to rallies, streets are historically full of life. Consequently, streets in India constitute a major part of the public realm that initiates congregation, celebration, and interaction among strangers. “Edensor examined “the culture of Indian street”⁵ and delineates the characters of Indian streets that differentiates it from streets of western countries. According to him, streets in western countries showcase controlled movement of traffic, pedestrian or commercial activities. They are part of the globalizing discourse, exemplifying civic consciousness and order of aesthetics. Whereas, Indian streets are spaces for the transaction of news and gossip organized around micro spaces such as tea stalls or rickshaw termini. They are the site for the entertainment of children playing cricket as well as political demonstrations (Figure 1). Thus, the streets are a constant stream of temporal activities, entertainment as well as commercial transactions. Akin to Edensor’s description even in the current times there are more than 10 million street vendors in India who constitute over 2.5% of urban population. A fairly high proportion (50%) in the city of Kolkata (Bhowmik, 2010). They are part of the active street culture. Thus,

⁵ Fyfe, Images of Street ,

, streets in most cases constitute the central ideas of Public realm or open space in Indian cities.⁶Arjun Appadurai ⁷outlines “Streets and their culture as the core of public life in contemporary India, where the weather is never too cold.”



Figure 1. Typical Street life in India depicting activities and cultural exchange

⁶ Sheha Mandan MIT Thesis “ Designing Indian Streets as Social Public Spaces – Contextual design and Planning in Bangalore”

⁷ Arjun Appadurai, “ Street Culture “ ,The Indian Magazine 8 (1) December 1987

1.4. Influence of Neoliberalism on Public Realm in Indian Cities

The advent of neoliberalism in India in 1991 and launch of New Economic Policy ⁸ advocated by World Bank and International Monetary Funds (IMF), changed the landscape of Indian Cities. The relatively high wages in the technology industry and economic growth witnessed the emergence of 'Urban Elites'. Increased private investment in infrastructure development, with rising consumerism and diffusion of western lifestyle norms, changed the essence of streets with time. The concept of "global city" with contrasting ideologies to original street life in India, evolved the street life and overall character of the public realm in India. India witnessed rapid urbanization between 1991 and 2001, with a 70% increase in urban population from 217 million to 377 million (Hidalgo D, 2013). The growth of private vehicle ownership became the trend in the cities among the urban elites.



Figure 2. Packed Delhi-Gurgaon Highway on massive power outage on, July 31 2012 (Source: Times Union)

⁸http://cgge.aag.org/GlobalEconomy1e/CaseStudy5_Bangalore_Aug12/CaseStudy5_Bangalore_Aug12_print.html

The informal character of streets and public activities started to change making space for growing infrastructure and automobile. Municipalities started framing new regulations, such as zoning laws, setbacks and FAR (floor area ratio) of buildings. Streetscapes were remodeled to prioritize vehicular traffic. Public right of way, spaces for the informal commercial transaction on street, space for social interaction that primarily resided adjacent to street gradually ceded to high-speed traffic roads. Densely populated metropolitans gave away their remaining open spaces and parks to the construction of Highways without compensating for the loss. Only 10% of city territory in Mumbai is available in Mumbai for over 13 million residents, which is only 9 square feet per person⁹.

The rising densities in the city and astronomical rise in property values in the city centers also resulted in low-density sprawl, the growth of satellite towns such as Rajarhat and Prbanchal in Kolkata, Dwarka in New Delhi and Navi Mumbai in Mumbai. Such new towns have prioritized automobiles and forgotten the cultural values of the streets in Indian cities. Characterized by wide roads, limited tree canopy, the absence of commercial uses lining the streets, the new satellite towns are least walkable and unsafe for pedestrians and bicyclists. Negligible pedestrian activities are witnessed in the street thoroughfare during the daytime. Thus, the current overarching concern of the Indian cities is to overcome the externalities of the decaying of cultural values of the streets that constituted a major part of the public realm. Although, the concept of public realm has been overused in Indian context yet designing and reclaiming public realm for building city identity is a fairly new concept in Indian cities.

⁹ http://india.blogs.nytimes.com/2012/09/03/in-mumbai-open-spaces-are-rare-and-rarely-open/?_r=0

2. Impact of current conditions in Indian cities

With time, the Indian cities have ceded the public realm to private automobiles. The population of six major metro cities in India increased by 1.9 times between 1980 and 2001 while motor vehicles went up over 7.75 times during the same period. The registered motor vehicles increased by 2.4 times on the whole during 2002 to 2011 (Datey A, 2012), while 19 metropolitan cities alone witnessed 8.8 percent growth per annum in this decade. The impression and idea of public space (public realm) as a place of community interaction and cultural exchange has clearly shifted to 'mere routes to commute' and get inflicted by stress and road rage

2.1. Congestion

The impact of increased automobile necessitated construction and widening of road infrastructures and flyovers. However, expansion of road encouraged the growth rate of private automobiles, increased traffic density and risk of congestion. The "Bathtub Model"¹⁰ introduced by William Vickery can be used to explain traffic congestion in the elaborate street networks. At the time when he introduced the concept, there were not enough empirical validation to this theory. In recent times, Daganzo (and his students at UC Berkley) was able to show a comparison of macroscopic flow density of three cities around the world, Yokohama, San Francisco and Nairobi(Daganzo F.C, 2008)(*Figure 3*).The observation shows that traffic flow significantly reduces as the traffic density increases and the ratio of traffic outflow to traffic flow almost stays constant (Arnott, 2015). Thus, increased road width and additional flyovers in the Indian cities did not entail reduced travel time. If the travel density cannot be regulated congestion will continue to rise. The peak hour speed of traffic ranges from 5km/hr(3.1 miles/hr) to 10km/hr (6.2 miles/hr) in the central areas of major cities (Singh, 2005). Studies by Center for Science and Environment have shown, the quantity of major pollutants such as Carbon Monoxide (CO), Hydrocarbons, and Nitrogen Oxides drastically increases with reduction in vehicular speed. At 75km/hr (46.6 miles/hr) speed

¹⁰ William Vickrey's developed a hypothesis that dynamics of rush hour traffic have the similar characteristics as water flowing in and out of a bathtub, where water flowing in the bathtub simulates the incoming vehicles into the stream while vehicles exiting the stream simulates water draining out

the emission of CO is 6.4 gm/vehicle while it increases by five times 33.0 gm/vehicle at a speed of 10km/hr(6.2miles/hr). As such, the traffic congestion not only results in delay, stress, and road rage but also increases pollution level.

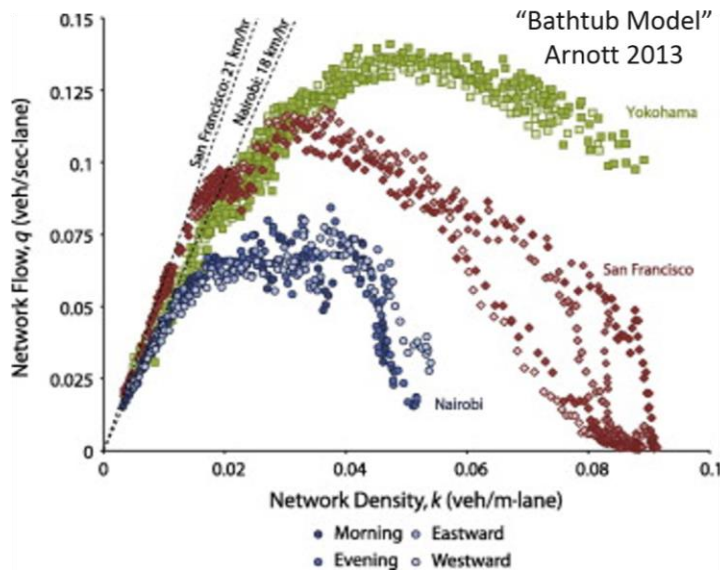


Figure 3. Comparison of macroscopic flow density phase paths for Yokohama, Nairobi, and San Francisco (Arnott, 2015; Daganzo F.C, 2008)

2.2. Impact on Health and Environment

The unplanned growth of motorized vehicles not only raised the cost of transportation which includes the cost of owning vehicles, fuel cost and the cost of travel time, but also it astronomically increased the cost to combat with health hazards. Indian cities are choking with hazardous pollutants that reduce the average life expectancy of city dwellers by 3.2 years (Greenstone M, 2015). Thirteen of the top 20 polluted cities in the world are in India, and PM2.5 (small particulate) levels in these cities are much higher than Beijing and Shanghai. WHO reported Delhi's air pollution levels are almost 2.7 times that of Beijing and 11 times that of New York City¹¹. The response to the dire statistics of urban pollution has been woefully inadequate and has not been addressed as a significant problem. Although most Indian metros have instituted strict monitoring of emissions from private vehicles, and Delhi has instituted a mandate for the use of natural gas in public vehicles, yet, the pollution

¹¹ WHO's Report 2014

levels in all metros, especially in Delhi, are growing rapidly. According to a report by Center for Science and Environment in 2015 air pollution alone is responsible for about 10,000 to 30,000 deaths in Delhi.

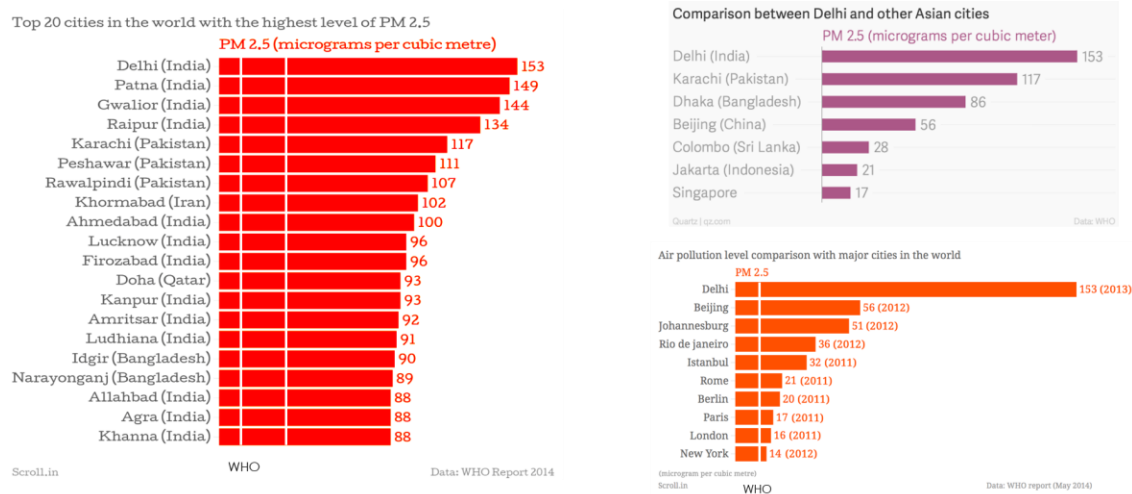


Figure 4. Top 20 cities in the world with highest level of PM2.5 (Source WHO Report 2014)



Figure 5. Commuters masked against air pollution negotiating city traffic. Mumbai, India (Source <http://www.vox.com/2015/2/24/8094597/india-air-pollution-deaths>)

2.3. Fatalities from road accidents

The number of road accidents in India is rising alarmingly. The statistics show that there is one serious road accident every minute and 16 die every hour on Indian Roads. Indian cities report more than 1,214 road crashes every year, of which two wheelers accounts for 25% of the road crash deaths. The severity statistics does not stop there; deaths of more than 20 children below the age group of 14 years are reported every day. The daily death toll due to road accidents totals 377, which is roughly equivalent to a jumbo jet crash. Uttar Pradesh records a maximum number of crash deaths each year. The severity of the statistics and careful reflection of the facts might even present a situation of an epidemic that needs urgent concern¹².

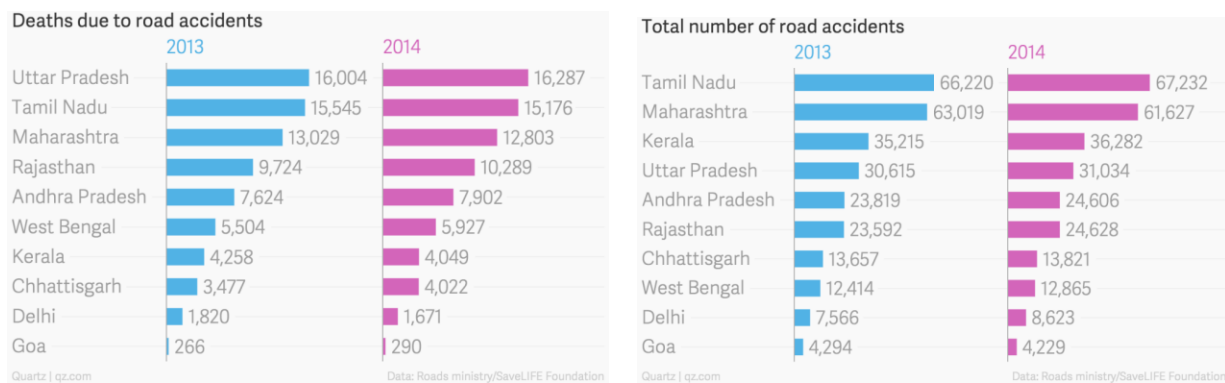


Figure 6. Bar Graphs showing Deaths due to Road Accident (left) and total number of road accidents in different States(right) (Data source, Road Ministry , Save LIFE Foundation |Visualization . Quart.com)

¹² Source: National Crime Records Bureau, Ministry of Road and Transportation; Ministry of Road Transportation & Highway; Law commission of India, Global Status Report on Road Safety

3. Why non-motorized modes of travel should be encouraged in Indian cities?

3.1. Mobility v. Accessibility

In this paper, we argue poor design of public space is the major source of the problem, causing a gradual decay in public health and causing severe pollution. While the conventional application of “transportation and land use linkages” has prioritized mobility, the recent theories of accessibility¹³ have made planners rethink the way roads and public spaces are designed.¹⁴ Studies show urban form provides a framework for human behavior, such as location decision and auto-ownership. The Urban form also has an impact on human activity and their travel decisions (Badoe A.D, 2000). Providing a rational context through the land-use and physical design of urban spaces people’s focus on accessibility can be reoriented. People who need access to a given mix of destinations and have varying physical and socio-economic abilities, do get to make a choice (

Figure 7). While the shift in focus from mobility to accessibility has resulted in better measures of effectiveness of a transportation system, the specific factors that improve accessibility are not well defined. As a result, accessibility measures do not necessarily reveal how interventions in the transport system can improve its effectiveness. This debate of effectiveness of accessibility is ongoing and has been addressed through contemporary ideas of reclaiming and reconstructing public realm. Options for better public place-making strategies and transportation options such as mode share, non-motorized modes of transport (walking and biking), has become means to foster accessibility and overall

¹³ Accessibility refers to the connectedness of different activity centers such as residential employment centers

¹⁴ http://trg-india.org/trg_conference_2015/keynote_speakers

mobility of individuals. Indian cities need to adopt these ideas and offer a better place of living for its residents.

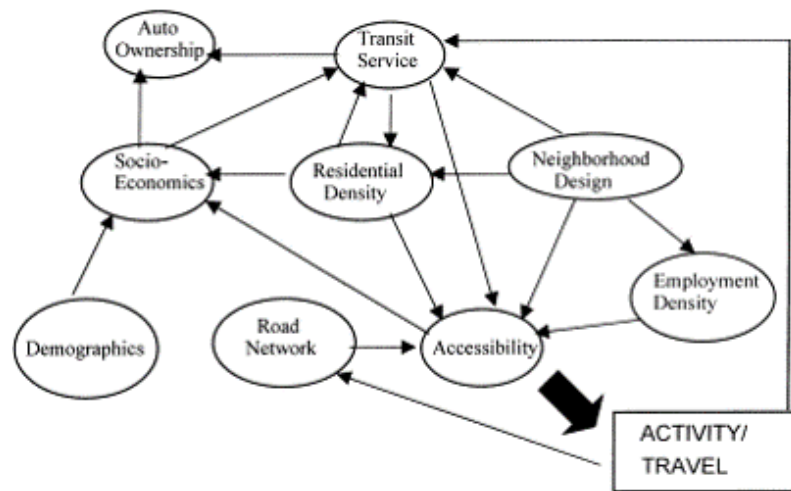


Figure 7. Transportation - land use interaction: empirical finding in North America and implication (Badoe A.D, 2000)

3.2. Socioeconomic factors and mode share in Indian cities

Indian cities have mix land use structure with a significant (15%- 60%) percentage population living in slums of informal settlements (Tiwari, 2011). 21.9% of the Indian population is below the poverty limit (Reserve Bank of India, 2012). World Bank estimated 276 million people in India lived below \$1.25 purchasing power per day. The current socio-economic status of the cities has resulted in short trip length irrespective of the size of the cities. 80% of the trip lengths in major cities in India such Delhi, Mumbai and Hyderabad, are less than 10km (6.21 miles) and 70% of the trip lengths less than 5km (3.10 miles). The high percentage of slum population in cities¹⁵ like Mumbai (54.5%), Delhi (18.7%), Hyderabad (17.2%) and Pune (19.4%) entails non-affordability of motorized vehicles as well as motorized public transport. The primary dependence on non-motorized transportation (NMT) even for long distance travel is common. As such short average trip length and a high percentage of low-income group residents can allow mode share of NMT to rise to 30% in larger cities and 60% in the smaller cities, where public transportation infrastructure is almost absent. Walking constitutes a significant 38% of mode share in smaller cities and 28% in larger cities (Figure 8). Travel trends in past three decades also show a sharp decline in

¹⁵ Reported by Census of India 2001

bicycle trips and rise in motorized two wheelers (MTW). The rising fuel prices in India has a negative impact on car sales in India, and projected sales of MTW is 8.1 times that of car sales. This rising percentage of MTW can jeopardize the air quality further as they are lightly regulated compared to other automobiles. Also, regarding increased emission of hydrocarbons and particulate matter, two-wheelers contribute more than cars (Goyal K.S, 2006). Thus, based on the current socio-economic condition of city dwellers and their travel trends, it can be established that investments towards the improvement of the public realm would essentially encourage walking and biking to destinations, downsizing the use of motorized two wheelers and significantly reduce vehicle miles traveled.

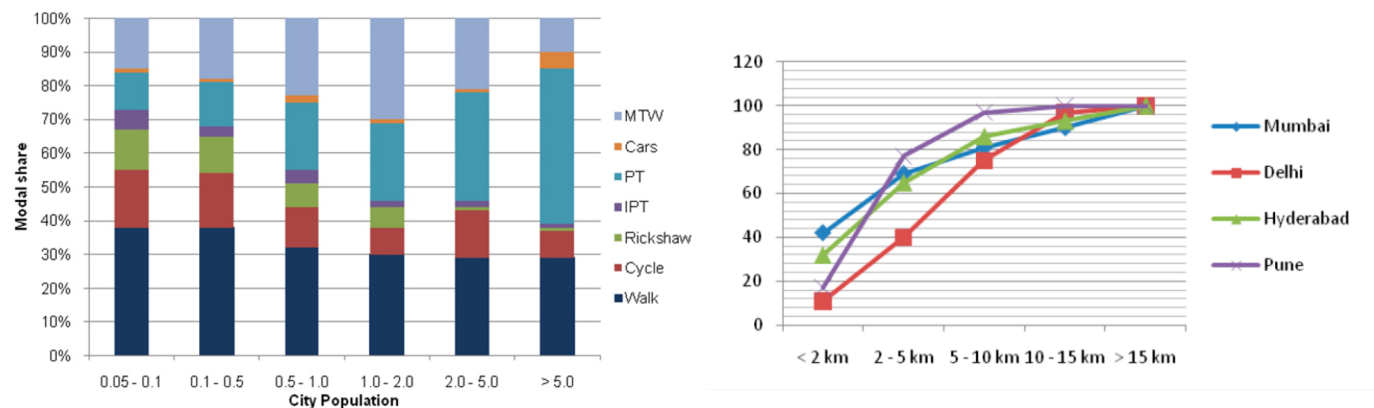


Figure 8 Mode Share in different cities in India (City population in Million), (left) / Average trip length in Indian Cities, (right) (Tiwari 2011)

4. Global Example Case Studies

4.1. United States

Auto ownership and increasing reliance on automobiles have rendered streets to thoroughfare of automobiles in the United States. Sprawl has been a potential threat to replace accesses-ways to highways and construction of streets with little or no pedestrian access. “Complete Street” movement has lately challenged the old paradigm by emphasizing on transportation choices for users beyond cars and automobiles (Schlossberg M, 2013).

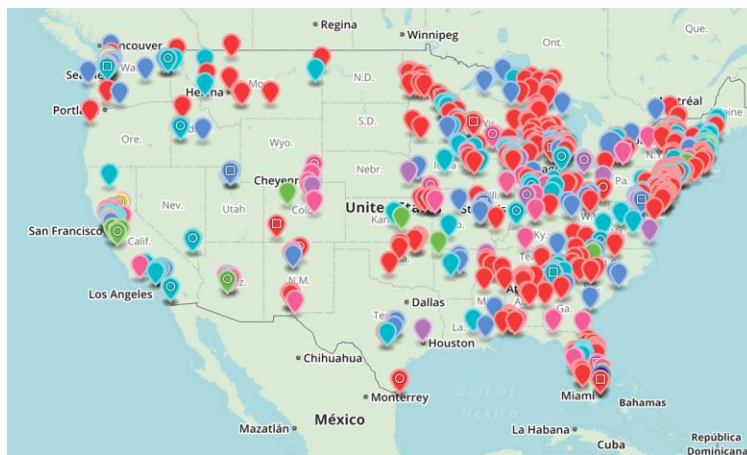


Figure 9 Complete Street Initiatives in United States (Source : National Complete Street Coalition)

Key: **Blue:** Laws & Ordinances | **Red:** Resolutions | **Yellow:** Tax Ordinances | **Purple:** Internal Policies or Executive Orders | **Magenta:** Plans | **Green:** Design Manuals or Guides | **Turquoise:** Policies Adopted by Elected Boards

According to US National Complete Streets Coalition, Complete Streets are "...designed and operated to enable safe access for all users, including, pedestrians, bicyclists, motorists, and transit riders of all ages and abilities¹⁶" (smartgrowthamerica.org). At the heart of the Complete Streets movement, is the contention that when streets are designed for only cars in mind, they often make walking, biking, and taking public transit inconvenient, unattractive, and even dangerous. By including walking and biking as important modes of travel, cities are able to foster better public health, lower transportation costs, improve access to local businesses and transit, significantly reduce GHG emissions, as well as improve the overall mobility of the transportation system. Complete street initiative in USA has been using various strategies encouraging different states to adopt this core idea. Such strategies range from law and ordinance changes, new tax ordinances, the introduction of design

¹⁶ <http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/complete-streets-faq>

manuals and guidelines for cities. The initiative also uses public outreach programs through the department of transportation (DOT's) in the cities such as Washington DC.

Ideas to improve public realm has gained momentum in the United States in the past decade. New York City has witnessed smart growth visions transformed into reality through major developments like High Line, Park Space in Lower Manhattan, neighborhood transformation at Green point & Williamsburg. Most of these places underwent major alteration in creating public places either using under-utilized infrastructure that posed a threat to the neighborhood, or densification of neighborhoods near transit. These spaces have not only added an extra niche to the city but also spurred developments that increased property values. High Line in New York, a 150 million dollar project with an estimated rise in property value up to 250 Million dollars evidenced a rise of 0.5 billion dollars in property value (Ted-Talk by Robert Hammond)¹⁷. The successful design of public spaces depends on its capacity to value individual's experience (Amanda Burden TED Talk)¹⁸, and public spaces are one of the most important reasons why a person chooses to stay in a city.

4.2. Shanghai, China

In the recent years of development, Asian cities have been through major transformations. With fastest and increasing trend of high-density development, it became imperative to use place-making strategies and transportation plans to improve the quality of life and improve accessibility. The Shanghai Bund in China exemplifies a massive public realm restructuring in past three decades. Bund not only recovered from the risk of obscurity and losing its grounds as a central urban space after 1980 (Henriot, 2010), but also went through a functional reform where functional docks, factories, and warehouses on the banks of the Huangpu River were either moved or repurposed. The aim was to create open space integrating residence, workplace, recreation, tourism and other functional land use within the city. Another key catalyst that spurred the transformation was Shanghai Bund's environmental protection role to reduce industrial pollution, increase biodiversity in the core city environment, and improve traffic conditions as well as overall quality of life of the

¹⁷ https://www.ted.com/talks/robert_hammond_building_a_park_in_the_sky?language=en

¹⁸ Amanda Burden, urban planner and urban designer in New York City, who played an active role in remodeling public spaces in New York City

city residents. Additionally, Nanjing Road, which is one of the primary connection of central city core and the Bund had also witnessed transformation since 1950. At the time, Nanjing Road used to be busy traffic road with scattered commercial activities. Currently, West Nanjing Road's, People's Square Plaza(Ren Ming Guang Chang) is a pedestrian-only zone with few road intersection, where traffic speed is controlled by bollards and different texture of paving.



Figure 10. Bund Before (1950) and After (2010)

In Shanghai, 30% of commutes were by bicycles in 2005(HaiXiao P 2010). Shanghai and other Chinese cities have witnessed challenges of overwhelming growth of automobiles and in some cases municipalities discouraged biking which led to a reduce use of bike over time. However, culturally biking has been a popular mode of transit in Shanghai and other cities in China. Annual electric bike (e-bike) sales in China grew from 40,000 in 1998 to 10 million in 2005(Weinert J, 2007). In recent years, the city of Shanghai is able to integrate bike infrastructure with different transportation modes (including cars, taxi, Buses) in its major road systems. The challenge that the city still needs to overcome is segregation of motorized two wheelers from the traditional bikes lanes which increase a potential risk of accidents and frequent crashes. Shanghai city government took special attention in constructing wide sidewalks and elaborate pedestrian bridges (such as in Lujiazui, Pudong) to encourage last

minute connectivity to destinations from subway stops. The pedestrian bridges and wide sidewalks reconfirm pedestrian safety and increase walkability.



Figure 11. Different transportation modes are provided with pedestrian friendly and bike friendly infrastructure (China)

4.3. Seoul, Korea

Seoul in South Korea has also witnessed major public realm improvements in the past decade. Cheong Gye Cheon restoration project has redefined the view of public realm improvement projects internationally. A ten-lane, 6 km long concrete highway in Seoul's city center was announced to be demolished in the year 2001. The construction work started in July 2003 and by October 2005, the busiest highway was converted into a 28-hectare river corridor with abundant open spaces, native flora, and fauna (Shin J.H, 2006). Cheong Gye Cheon was originally a tributary of the Han River and when Seoul became the national capital it was a valley of clean water. With the pressing need of urbanization and fast industrialization, the clean water valley was transformed into a large sewer which in the period of 1967 – 1976 was proposed to be transformed to a 6 km long ten-lane highway supported by a concrete deck. Further, an elevated four-lane highway was constructed on top to account for high traffic demands. The increasing pollution and the risk of health hazard from the unsanitary conditions under the covered road led to the current scenario of



Figure 12. Cheong GyeCheon Redevelopment in South Korea (Before and after)

development. The project essentially demolished the ten-lane highway and converted it into the two-lane road on both sides of the river. It involved the formation of the new watercourse of 5.4 km long and adjacent landscaping. The two vital challenges were reducing the loss of the local business and meeting the congestion issues during construction work. Provision for stability funds overcame the local businesses loss, allowing for their relocation. Traffic congestion issue was reduced with new policies of public transportation. Cheong Gye Cheon is now an urban regeneration benchmark. It also improved the biodiversity in the center city. The development is a huge success from the perspective of adjacent communities, and it has witnessed a footfall of over 10 million in the first three months following its restoration, spurring economic development in the adjacent land use.

4.4. Tokyo, Japan

The history of growth pattern in Tokyo and the progression of changes also exemplify similar principals. Post-war reconstruction policy of Japan is marked by rapid urban growth from 1950's to 1980's. Less restriction was imposed on urban development controls that resulted in serious environmental issues. With the economic bubble burst in 1990's the environmental and economic issues were addressed through massive public works and infrastructure development (Santos, 2014). The focus was on the spatial relationship between infrastructure, public space and landscape. One of the examples of hybrid infrastructural development is Yamate Dori and Ohashi Junction.



Figure 13. Bike lanes in Yamate Dori, Tokyo Japan (Source :<http://www.tokyobybike.com/2014/09/tokyo-bicycle-lane-designs.html>)

Yamato Dori is a major metropolitan thoroughfare widened in the recent years and accompanied by a 30-meter deep underground tunnel. The *Yamato Dori* tunnel connects to other Expressways in *Ohashi* junction. Major improvements are noticed in the surrounding infrastructure to allow easy public access to different levels. On the sidewalks in Yamata Dori, there is integrated bike-ped infrastructure that does not use any physical barrier to segregate cyclists and pedestrians. The shades of pavement stones on the pedestrian and cycling areas are slightly different and demarcated by white paint and overhead signage. However, one of the externality is that the integrated bike-ped infrastructure is often used for parking cars, as areas of Yamata Dori do not have adequate street parking and motorists take advantage of the wider sidewalks, thus making the environment dangerous for pedestrians and cyclists.

The global case studies exemplify how local governing bodies in different cities are attempting to improve public spaces and streetscapes. Challenges in the cities of Western countries are quite different from those in Asian cities. This section of the paper highlights some of reclaiming and redesigning strategies of the public realm in big metros around the world. Indian cities although witnessed some mega-scale development in past decades yet not a significant amount of work have been realized over the past years that are comparable

to the global examples. It is expected that local governing bodies in the major Indian cities will be inspired by global policies and toolkit for public realm improvements.

5. Possibilities of Transformation in Indian Cities

The examples of public realm improvements, their success, build further precedents to comprehend the necessity of public realm improvements in Indian cities. It is essential to embrace the fading significance of public realm in Indian cities. The question is, if it is possible to realize such strategies to improve accessibility, quality of life and environment in Indian cities. Reclaiming the public realm by reducing the primacy of cars and objectively recognizing the non-motorized modes of travel (walking and biking) while designing streets should be the primary intent of urban designers and planners. The question of possibilities of transformation is a critical one. Fred Kent, the president of Project for Public Spaces (PPS), stated “You have to turn everything upside down to get it right –side up”. Place-making, and re-visioning public spaces in Indian cities require a clear vision and executable ideas. Such re-visioning process might involve knocking down of certain structure or incremental changes to the current condition. The government in most cities do have long term development plans but whether those development plans incorporate clear and detailed design guidelines to build successful visionary ideas into reality is still uncertain.

5.1. Public Realm Development Plans in the Cities

In recent times, Indian cities are witnessing large and small scale public realm redevelopment plans and projects. Sabarmati riverfront development project, 11 km long walkway and river access along east-west banks of Sabarmati river in Ahmedabad have opened up to public since 2012¹⁹. The planned development has 31 Ghats (i.e. water access points) along the promenade of the river with facilities such as boating stations and venues for other activities. The project has seen success, in the past year. Other amenities such as public park, event venues, marketplaces, sports complex and residential neighborhoods are planned around it. The project is ongoing.

¹⁹ <http://www.sabarmatiriverfront.com/>

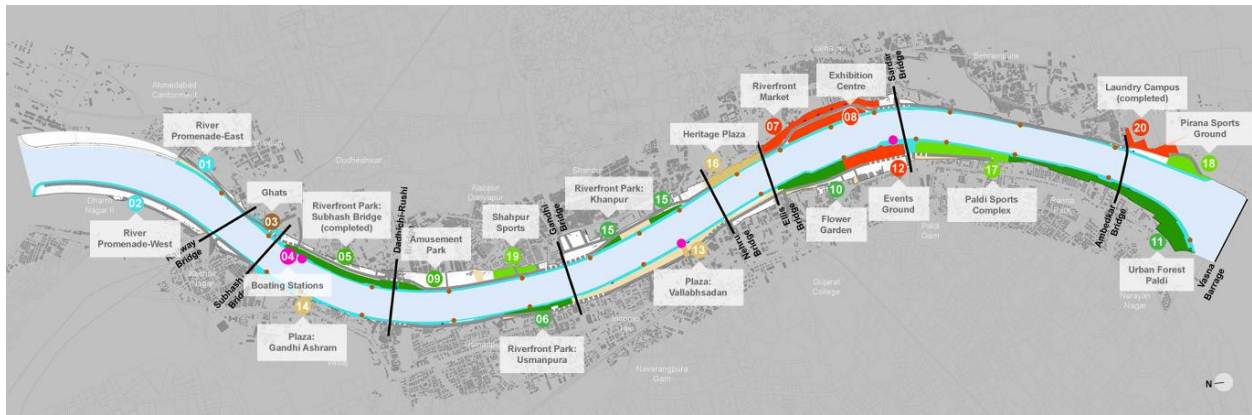


Figure 14. Sabarmati Riverfront Development Plan, Ahmedabad (source <http://www.sabarmati-riverfront.com/>)

The city of Kolkata, reveals plans for riverfront makeover along Hooghly riverfront. The project is to be funded by World Bank, which is a part of, National Ganga River Project scheme²⁰. Currently, Kolkata Metropolitan Development Authority (KMDA) is in the process of determining the space planning and technical planning strategies with various public and private agencies.

5.2. Events and Awareness programs

Apart from physical planning projects, the idea of active streets and old cultural values of Indian streets are gradually witnessing revival through public and private engagement. 'Project for Public Spaces (PPS) reports an event in Gurgaon New Delhi called *Raahgiri Day*²¹. *Raahgiri Day* is a public response to the social, economic, and spatial needs of the community.



Figure 15 *Raahgiri Day*, a public response in Gurgaon New Delhi to the social, economic and spatial need of the community (source: www.pps.org)

²⁰ <http://timesofindia.indiatimes.com/city/kolkata/World-Bank-to-fund-Hooghly-riverfront-revamp/articleshow/48780797.cms>

²¹ <http://www.pps.org/blog/sweet-rebellion-reclaiming-indias-streets-with-raahgiri-day/>

The event has created momentum for “Streets as Places” movement. It is organized through rigorous planning and outreach strategies of a Non-Motorized Transportation think tank (NMT) and the team’s robust partnerships with groups like the New Delhi Municipal Corporation (NDMC), the Fire Department, and City Transportation Departments. The team used “Lighter, Quicker, and Cheaper” (LQC) approach to transforming their streets into bustling public places, providing moveable amenities like pop-up stages and bicycles.

Similar events called Happy Streets gained momentum in Noida New Delhi²² at GIP Mall Sector 18 and Park Street in Kolkata ²³.Traffic is shut down for three hours on Sunday morning (usually 6:00 AM to 9:00 AM) and the street is used for hosting events such as musical performances, mini sports events, cycling, jogging, and walking. It is evident that a change in perception about street life is regaining interest and through public and private cooperation such events are becoming possible. Thus, it is a ripe time to employ strategic design changes in public realm that can slowly transform the current condition of public spaces and streets in Indian cities



Figure 16. Happy Park Street in Kolkata (Source: Fliker.com)

In this paper, we not only analyze the problem and attempt to point to a solution, but we also show examples through an actual case in Kolkata, how streets and its adjacent uses in Indian cities can be transformed through concepts such as those in Complete Streets. The examples are schematics providing key design ideas for implementation.

²² <http://timesofindia.indiatimes.com/entertainment/events/noida/Happy-Streets-kickstarts-in-Noida/articleshow/51482755.cms>

²³ <http://timesofindia.indiatimes.com/city/kolkata/Its-time-for-Happy-Streets-2-0/articleshow/50555330.cms>

6. Case Study in Kolkata

6.1. Site selection:

For the purpose of formulating design strategies, a planning range is selected as an initial step (Figure 17). It starts from the Rashbihari Avenue in the north and continues up to Prince Anwar Shah in the south. The east-west stretches of the planning range include Rashbihari Avenue, Gariahat intersection to Kalidas transit station. The area selected encompasses a diverse range of land use such as employment areas, commercial and retail activity centers, educational institutions, recreational facilities, dense residential neighborhoods and transit corridor. Most of the primary streets have multimodal transit options such as public and private bus services, transit stops, trams (similar to electric trolley/street cars), private vehicles, autorickshaws (3 wheeler vehicles), and bicycles. Apart from that, on-road freight services that supply goods to the local businesses are found at random hours. Non-motorized good carriers are often witnessed during the prime hours of the day. Additionally, there is a strong presence of street vendors along the primary streets and customers flock around, leaving minimal space for pedestrian movement. Miraculously, there is an understanding between the street components to function and stay mobile in the existing conditions. However, it is increasingly challenging for the safety of the pedestrians and commuters using non-motorized vehicles. The unsafe conditions of the road act as a deterrent for pedestrian's pleasure walk and use of non-motorized vehicles, which accounts for only 3.5% of on road traffic in the streets of Kolkata²⁴.

6.2. Street Typologies studied

The methods used to conduct the existing status analysis and delivering design recommendations are walking tour and resident's perspective. Google satellite maps are used for mapping, modeling and analyzing the street networks, spatial arrangement, and scale of buildings. Considering 45.4% of road length in Kolkata is a four-lane road and 27.5% of road length comprise two-lane roads²⁵, the study area selected predominately comprise

²⁴ Source: SGI Primary Survey, Comprehensive Mobility Plan, January 2008

²⁵ SGI Primary Survey, Comprehensive Mobility Plan, January 2008

of four-lane and two-lane roads. The streets studied within the planning range are categorized into **six types**:

Type 1 - Primary two-way streets and street intersections with overpass

Type 2 -Primary two-way intersection with heavy traffic with existing infrastructure for other vehicular modes.

Type 3- Circular intersections (round about)

Type 4- Primary two-way streets and intersection with heavy traffic volume and inadequate capacity

Type 5- Narrow streets with disproportionate land use and density for two-way lanes

Type 6- Residential streets and streets with less traffic load (*Figure 17*)

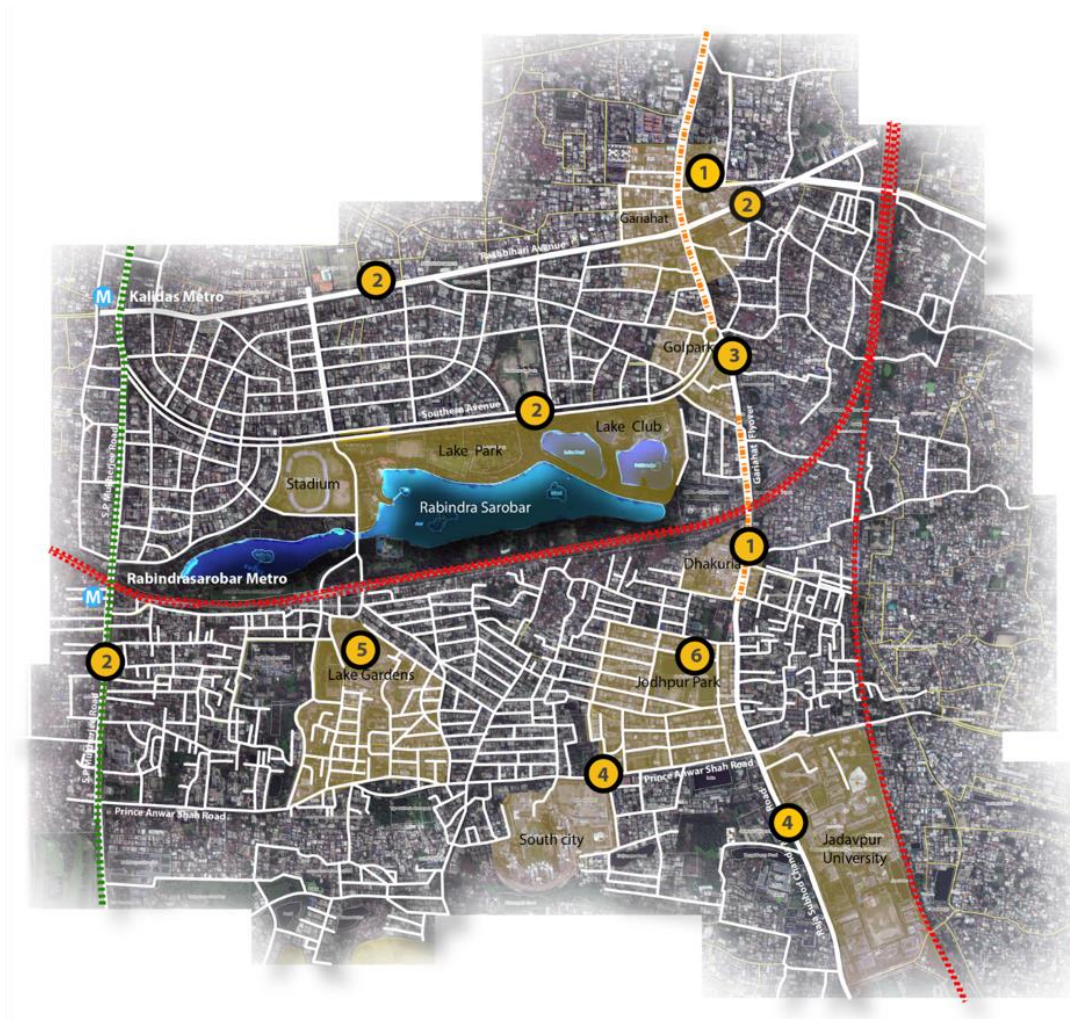


Figure 17. Map of South Kolkata showing planning range and types of roads categorized; numbers on the map are associated with road types mentioned in this section

Subsequently after studying the characteristics of the streets and their individual design issues, they are re-programmed/ redesigned and specific modifications are suggested for each type. Refer to Table 1 for the comprehensive list of design strategies.

6.3. Design Strategies

Each type of road is associated with a design strategy based on its characteristics. The four basic strategies uses are summarized below, (Refer Table1.)

- A. Major two-way streets with segregated bike lanes, and vehicular lanes.
- B. Major two-way streets with bus-only lanes, car only lanes and segregated bike lanes
- C. One-way street with bike lanes
- D. Limited Traffic roads with segregated bike lanes (*Figure 18*)

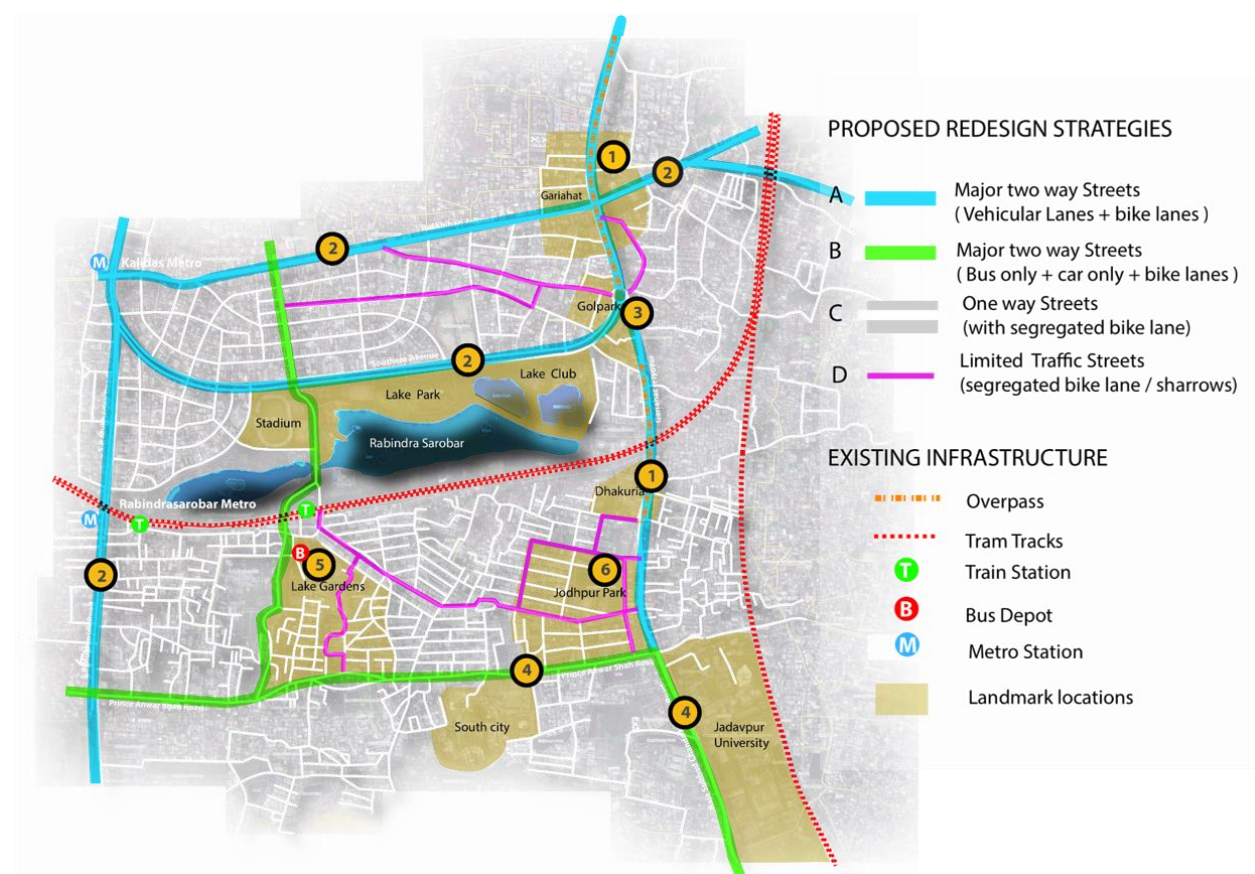


Figure 18. Planning range map showing design strategies associated with each type of roads; numbers on the road are associated with the types of road mentioned in section 6.2

	Current Condition	1	2	3	4	5	6
Proposed		Primary two way streets and intersections with overpass /under the bridge spaces Predominantly High Density, Mixed Use, Commercial Activities Street vendors	Primary two way Streets and Intersections with heavy Traffic Existing Infrastructure for Tram / other modes of Transportation	Circular roundabout Predominantly High Density, Mixed Use, Commercial Activities	Primary two way streets with high traffic volume Inadequate road width Proximity to Educational Institutions Adjacent High Density / High-Rise Residential and Commercial developments	Narrow two way streets Predominantly residential and small scale commercials Proximity to schools , neighborhood parks	Narrow two way streets Predominantly residential and small scale commercials Provides easy and short path to major commercial hubs / market areas
A	Major two-way streets with segregated bike lanes, and vehicular lanes.	One- way bike lane on either side of the road Improve under the bridge spaces	Renovate the existing infrastructure for trams / other modes	Two-way continuous (circular) segregated bike lane			
B	Major two-way streets with bus-only lanes, car only lanes and segregated bike lanes				Provide bus stops / taxi stops for people who need to change mode of transportation. Increase safety measures		
C	One-way street with segregated bike lanes					One way streets with improved sidewalks and signals	
D	Limited traffic roads with segregated bike lanes						Limited to resident traffic. No non-resident traffic allowed.

Table 1: The Road Typologies and corresponding redesign strategies (the Strategy A is applied to Road Type 1, 2 & 3 with minor modifications, Strategy B, C and D are applied to Road Type 4, 5, and 6 respectively). Each Redesign Strategy is specific to Road Typologies

7. Existing conditions study and Recommended Design Strategies

For the purpose of developing design strategies both physical and social characteristics of the roads studied. The measurements of are not obtained through engineering drawings; hence, there are chances of erroneous assumptions. However, the purpose of this research and design is to catalyze creative thinking and analyze ways to improve public realm in Indian cities. The goal of this framework is to provide generic guidelines for comparable road infrastructure.

7.1. Type 1 & Type 2 Roads – Gariahat Road and Rashbihari Avenue Intersection

7.1.1. Characteristics of Gariahat and Rashbihari Avenue

The Gariahat Road and Rashbihari Avenue are categorized as a combination of primary two-way intersection with overpass & high traffic volume and existing infrastructure, dysfunctional tram track. Streets are characterized by series of large, small and medium scale retail stores and street vendors along the sidewalks leave very little space for the pedestrian activity. Pedestrians resort to jaywalking alongside the main traffic lanes to avoid crowded sidewalks. There are no special infrastructure for bicyclists. Whoever bikes along the streets are at their own risk of crashes. The Gariahat Bridge overpass stretches along north-south direction leaving a significant portion of the street shaded under the bridge. The shaded part is used as parking space for cars and motorized two-wheeler vehicles. There is a dysfunctional electric tram track stretching along the east-west direction on Rashbihari Avenue.



Figure 19. Photographs showing Gariahat Road and Rashbihari Avenue intersection, the overpass along Gariahat Road and the tram track along Rashbihari Avenue

7.1.2. Redesign Strategies [A]; Reprogrammed as major two-way streets with segregated bike lanes and vehicular lanes

The reprogramming strategies include, acquiring right of way for widening the sidewalks from the wide roads, adding landscape buffer adjacent to the busy traffic lanes. The segregated one-way bike lane is proposed on either side of the road. The bike lanes should be colored and segregated using lane bollards (poles). Wayfinding symbols are recommended to indicate cycling direction to the nearest prime destinations. Further two-way vehicular lanes are proposed for public and private bus routes as well as cars. The extreme lanes are proposed to be used as turn lanes. Road intersections are redesigned with proper curb cuts, and paved crosswalks could reduce jaywalking and minimize the number of accidents. Tactical urbanism measures along the extensive 'under the bridge corridor' are proposed. The parking spaces are suggested to shift to one level basement parking along Gariahat Road, and the space under the bridge is proposed to be reused for placing designed street vendor kiosks. This aims to preserve the street character and shopping spirit of Gariahat allowing the retail stores to enjoy street frontage.

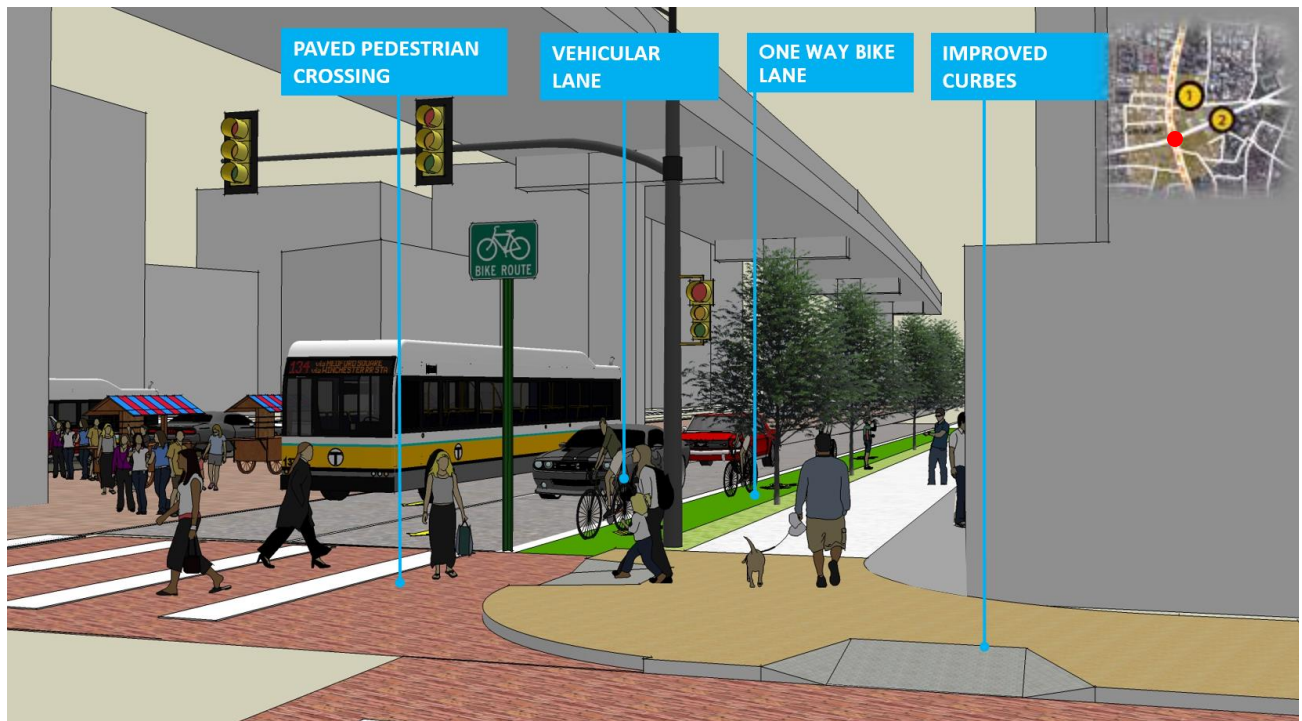


Figure 20. Redesign Strategy [A], showing the suggested changes for Gariahat and Rash Bihari Road Crossing



Figure 21 Redesign Strategy [A] showing suggested changes under the bridge and on Gariahat Road

7.2. Type 3 Roads – Golpark

7.2.1. Characteristics of Golpark Circular Intersection

Golpark is a vibrant activity center in the heart of South Kolkata. The road at Golpark is fundamentally the extension of Gariahat Road and ends in a circular intersection. From this point, the road extends further south as Dhakuria Bridge and Raja Subodh Chandra Mullick Road. The adjacent land use is characterized as a high-density mixed-use development with high-end residential neighborhoods, retails, restaurants, performing art center, movie theater. They act as attractors for cultural enthusiasts. Also, there are several key educational institutions in close proximity. South City College, Rama Krishna Mission Institute of Culture located at the south end of the intersection. Jadavpur University and research labs are located further south. The institutions account for the high density of young population in the area (between age group 18-25 years). However, narrow sidewalks and discontinuous barriers along sidewalks leave the pedestrians susceptible to unpleasant walking conditions and road accidents. The traffic signals and pedestrian crosswalks seldom function harmoniously. Dedicated bike lanes are absent as such crashes between vehicular traffic, and non-motorized traffic is frequent. Such alarming road incidents around the roundabout discourage residents, employee and students to walk or use the bike as an active mode of transport to their destinations.



Figure 22. Pictures of Golpark Circular Intersection

7.2.2. Redesign Strategies [A]; Reprogrammed as two-way streets, with segregated bike lanes, and vehicular lane

The circular intersection is proposed to be redesigned as a major two-way street with segregated bike lanes, and vehicular lanes. A circular two-way bike lane in the roundabout is proposed to facilitate bicyclists to bike at the intersection without hindrance.²⁶ Slightly raised and colored bike lanes are suggested to increase visibility. The speed of the vehicular traffic can be limited at intersections using tight corner radii. The continuous bike paths are aimed to offer wider right of way to the bicyclists minimizing chances of accidents and crashes. Leading pedestrian intervals (LPI) are proposed to reduce pedestrian and vehicular collisions. The LPI's should either be paved or marked to improve visibility. The circular intersection is proposed to be redesigned as a major two-way street with segregated bike lanes, and vehicular lanes "Gateway" treatments are desirable to delineate transitions and check the speed of the left turning vehicles. Yield and stop signs can be added to give priority to the pedestrians and bicyclists. Integration of open corner space (if any) with sidewalks along with landscape buffer is a major public realm improvement strategy suggested to provide a sense of safety to the pedestrians.

²⁶<http://www.fietsberaad.nl/index.cfm?lang=en§ion=Voorbeeldenbank&mode=detail&repository=First+roundabout+with+bike+paths+and+right+of+way+for+cyclists#>
<http://www.melendrez.com/project-categories/streetscape-trails-corridor-planning>

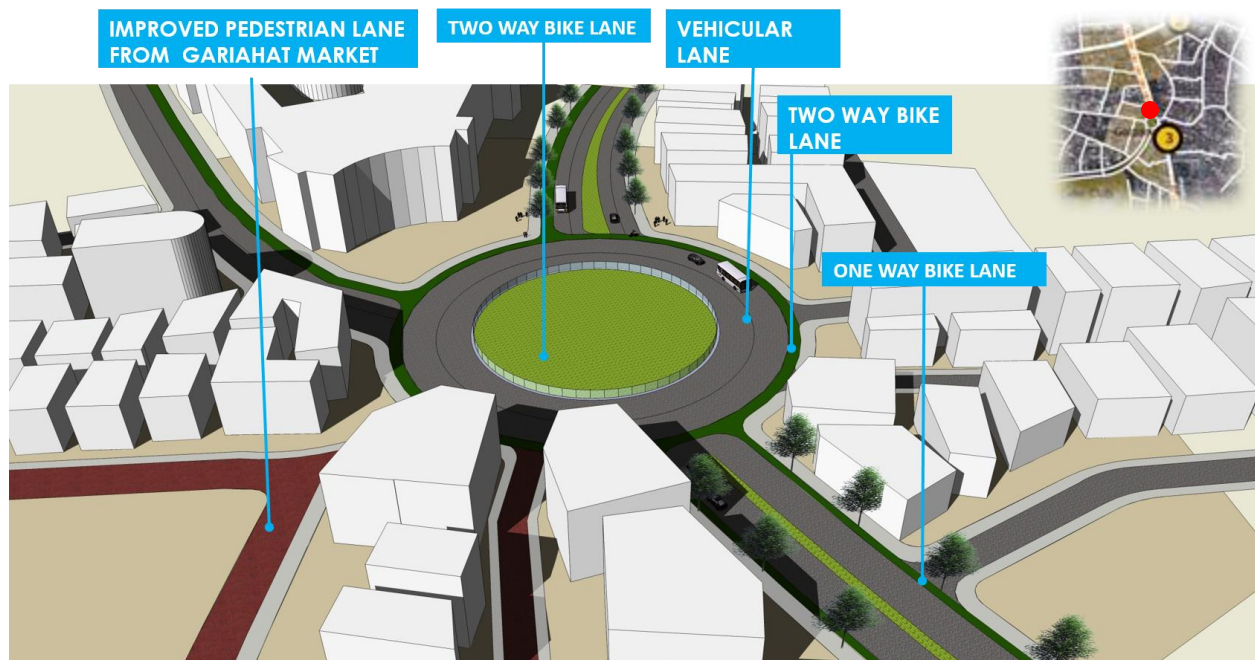


Figure 23. Redesign Strategy [A], showing suggested changes in the Golpark round about, proposed two-way continuous bike lane, and pedestrian connections highlighted

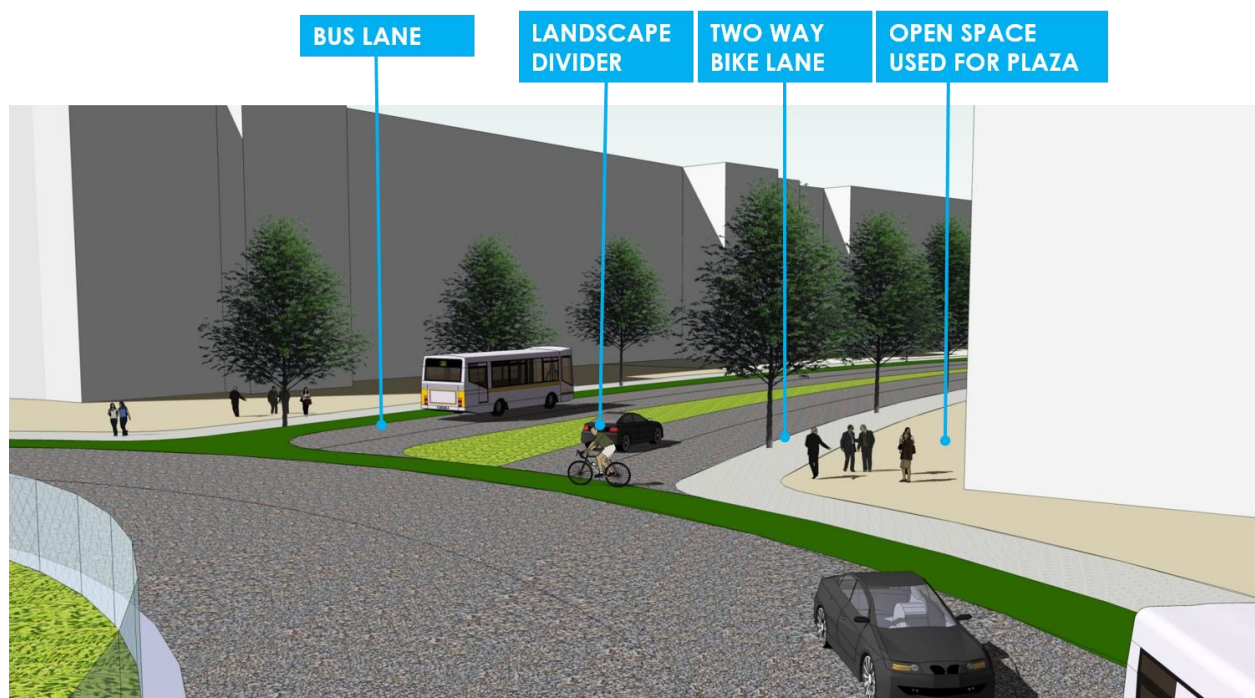


Figure 24. Redesign Strategy [A], Showing eye level view of Golpark highlighting the continuous two-way bike lane, landscape buffer and corner open space integrated to sidewalks

7.3. Type 4 Roads – Intersection of Prince Anwar Shah Road & Raja Subodh Chandra Mullick Road

7.3.1. Characteristics of Prince Anwar Shah (PAS) and Raja Subodh Chandra Mullick (RSCM) Road



Figure 25. Pictures of Prince Anwar Shah and Raja Subodh Chandra Mullick Road Crossing

Prince Anwar Shah Road is characterized as a two-way road with high traffic volume and inadequate capacity for the current traffic and pedestrian volume. It is adjacent to a premium residential, commercial locale, major educational institution and transit hub of Tollygunge in South Kolkata. The South City Mixed-use development is the adjacent key real-estate development project over 31 acres of land area with high-rise residential towers and South City Mall. The road witnessed exponential traffic growth as the redevelopment came to completion. The intersection of RSCM road and PAS road could be characterized as one of the busy nodes, used by university students and office goers. A large percentage of daily commuters are students from Jadavpur University, as the university hostel is situated on Prince Anwar Shah Road. They are either waiting for a bus or three wheeler auto rickshaw at the intersection to commute to the university or nearest transit stop at Tollygunge metro station. During the prime time of the day, traffic is a complete standstill. Although the sidewalks and pedestrian infrastructure exist, it is insufficient and inadequately used due to the intrinsic fear of penetrating crowd and disorder of the congested street. Unauthorized street parking of taxi and three wheelers adjacent to the sidewalk entails rising concern. The traffic load discourages bicyclists with frequent crash reported.



Figure 26. Pictures of Prince Anwar Shah Road in front of South City Mall

7.3.1. Redesign Strategies [B]; Reprogrammed as two-way streets with bus only lane and segregated bike lanes

Prince Anwar Shah Road and Raja Subodh Chandra Mullick Road is proposed to be reprogrammed as major two-way streets with the bus-only lanes, car-only lanes, and segregated bike lanes. Providing right of way for segregated two-way bike lanes would ensure safe biking route to the university students who otherwise resort to three wheelers (considered a faster means of transport for short distances). In addition, bike-sharing facilities if added near Tollygunge transit hub would benefit university students, faculty, office goers, and the residents as well. Improvement of sidewalk conditions adding green buffer and bollards (poles) to keep a minimum physical distance from busy traffic is a necessity. Provisions for landscaped road divider, bus stops, and taxi stops would allow people to board public buses, and taxis at specific spots and prohibit them to halt at random locations. The bike facilities are alleged to minimize the traffic of motorized two and three - wheelers (auto rickshaw) by providing easy access to transit and nearby facilities. Unifying certain areas of sidewalk and commercial building setbacks is expected to increase the capacity of sidewalks and hold spill over foot traffic from the malls.

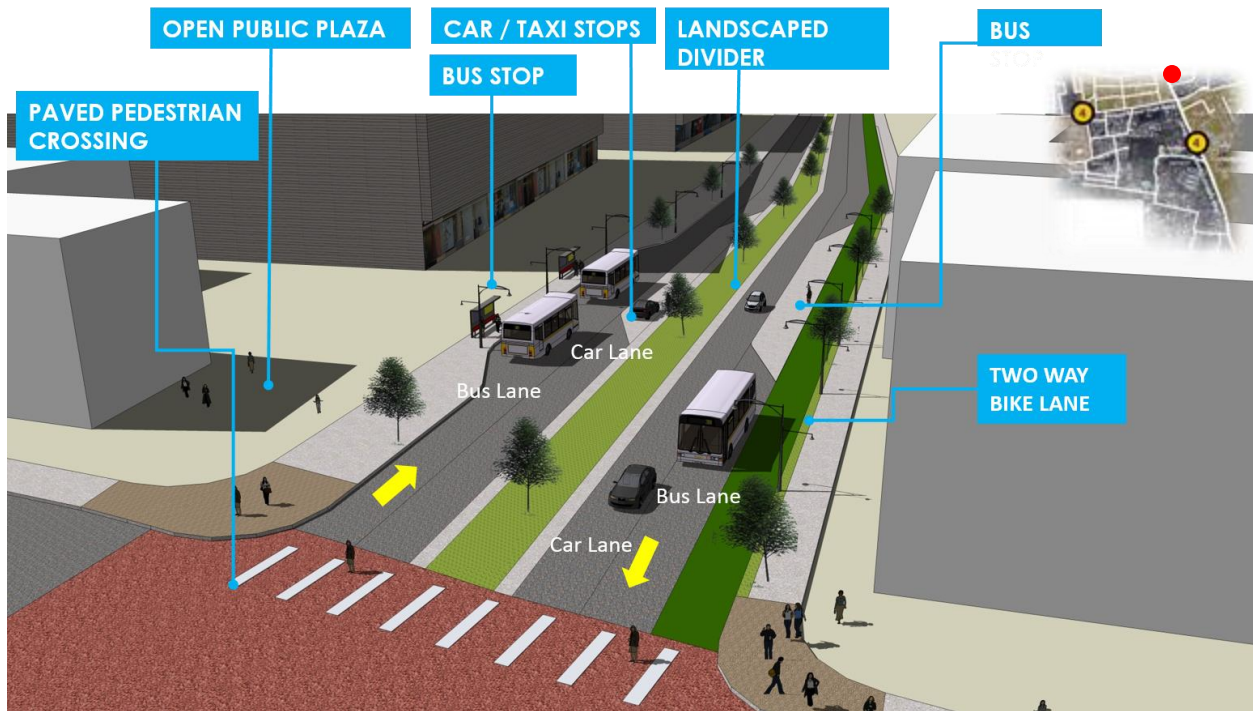


Figure 27. Redesign Strategy [B], Showing Prince Anwar Shah and Raja Subodh Chandra Mullick Road intersection, Right of way for segregated two way bike lane, segregated bus and car lanes, other improvements such as designated taxi stops and bus stops aims to facilitate pedestrian movement at this busy street intersection

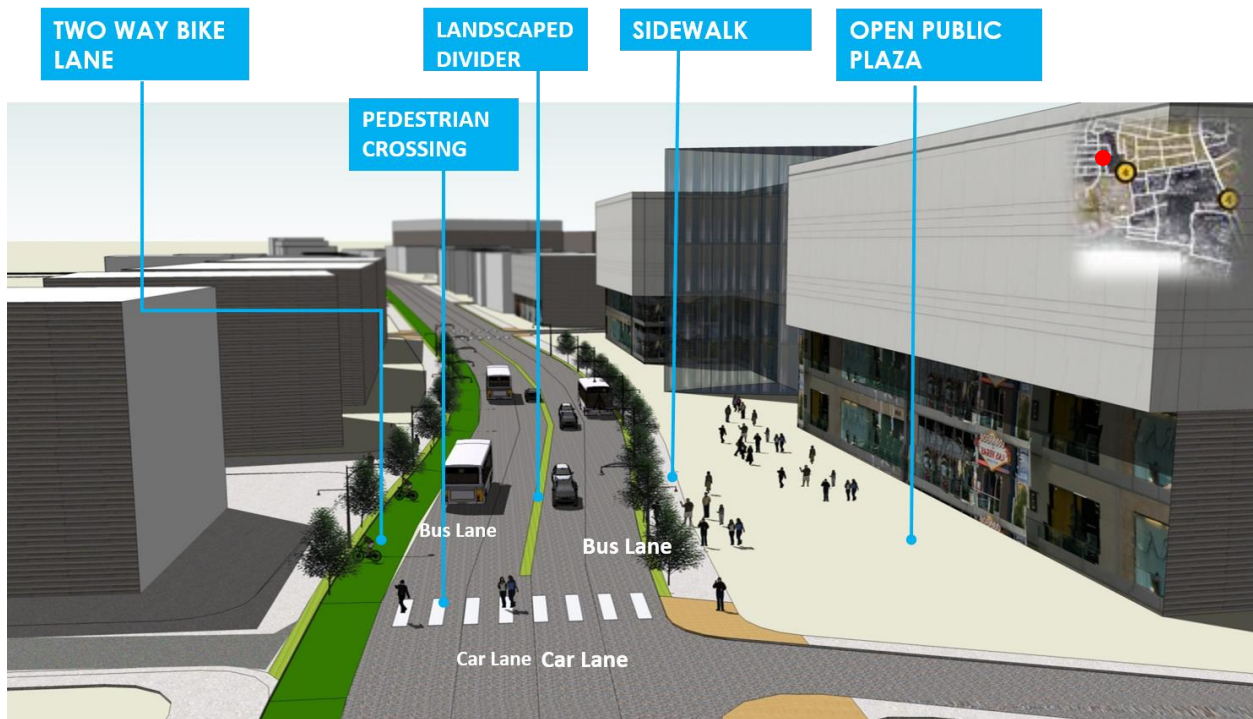


Figure 28. Redesign Strategy [B], Showing segregated two -way bike lane in front of South City Mall, unified sidewalks with building setbacks allowing that can hold spillover

7.4. Type 5 Roads- Jodhpur Park neighborhood (Narrow streets with disproportionate land use and density for two – way lanes)

7.4.1. Characteristics of Jodhpur Park neighborhood streets with intermittent heavy traffic

Jodhpur Park neighborhood, north of Prince Anwar Shah Road is predominantly a residential neighborhood. The roads are characterized as narrow two lane traffic roads. Nevertheless, they witness heavy traffic load during the peak hours of the day, daunting pedestrians, school children, and bicyclists within the neighborhood. One of the major problems of the neighborhood is that it is adjacent to the major arterial road and experiences huge influx of traffic that detour through the inner roads to reach their destination faster. Currently, most inner roads are two-way traffic roads with narrow sidewalks. Frequent crashes, jaywalking amongst pedestrians are a common observation. In most inner roads, traffic signals, stop and yield signs to control the flow of traffic and provide road safety to pedestrians are non-existent.



Figure 29. Pictures showing Jodhpur park Neighborhood Streets, with intermittent heavy traffic at times freight traffic that interfere with road safety and preserving residential neighborhood character ,

7.4.2. Redesign Strategies [C]; Reprogrammed as one-way streets

The secondary streets have less traffic load compared to any arterial thoroughfares. Traffic load reduction on the streets should be encouraged to avoid the congestion and increase safety. As such , the inner, secondary streets of Jodhpur Park is proposed to have one-way traffic, furnished with street names, wayfinding signage, traffic signals, stop and yield signs at definite intervals. One-way traffic is intended to facilitate right of way expansion for sidewalk, provision for two-way bike lanes and bike storage facilities along sidewalks. The bike share facilities in the neighborhood and transit stops are envisioned to encourage the

residents to use the bike for short commutes reducing overall use of motorized traffic. In addition, widened sidewalks can amplify daily physical activities of residents by providing adequate infrastructure for walking and running. Additionally, Using LPI at certain intersections, tight turning radius through extended curbs and paved streets, can considerably improve the user experience of the urban space. Provision for on-street parking and well-delineated landscape features are expected to act as a speed check for through car traffic

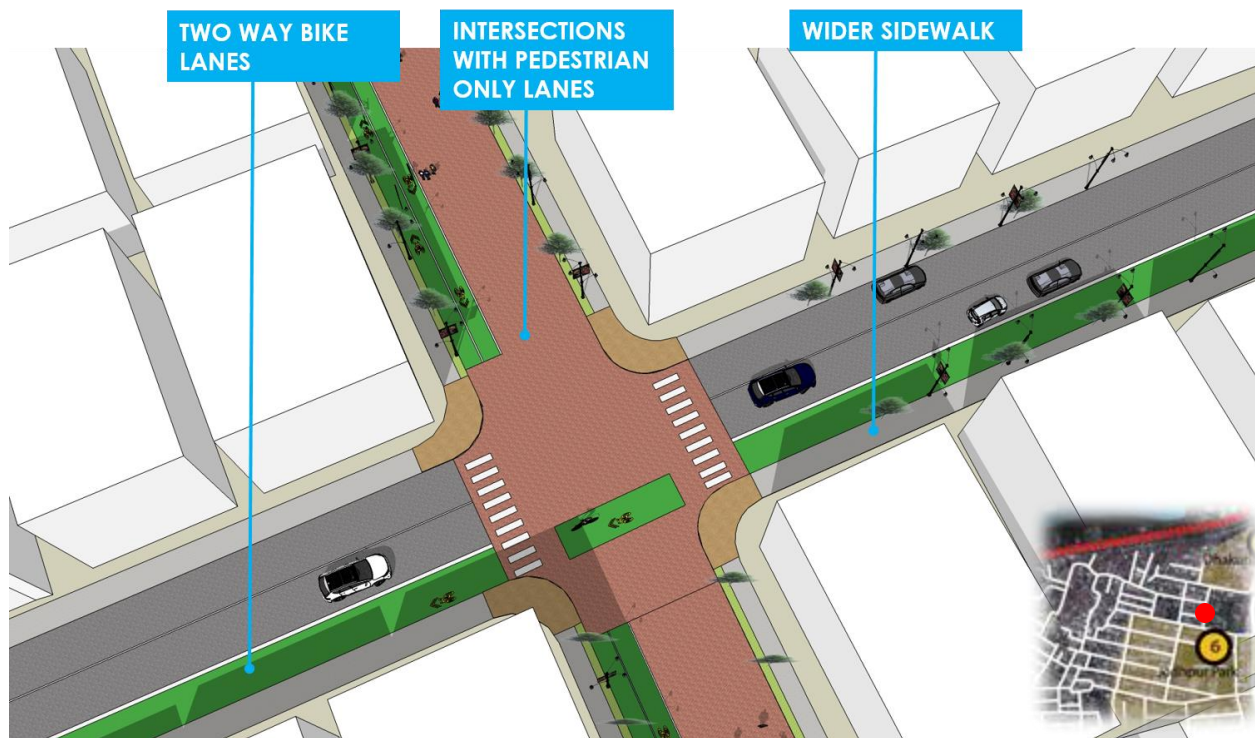


Figure 30. Redesign Strategy [C], Showing proposed one-way Streets in Jodhpur Park neighborhood with two-way bike lanes, wider sidewalks and intersection with paved pedestrian walkway on the assigned limited traffic streets.

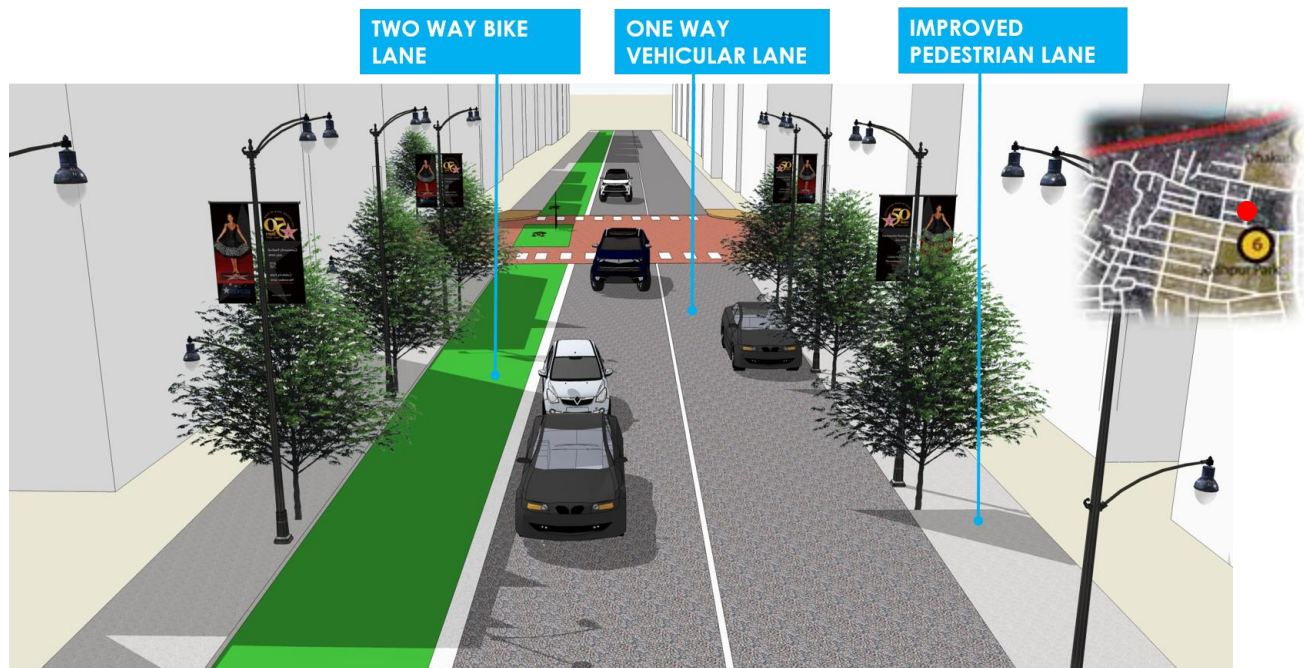


Figure 31. Redesign Strategy[C], showing assigned one way street, improved wider sidewalks , two-way bike lanes, and street furnishing .

7.5. Type 6 Roads- Jodhpur Park neighborhoods (residential streets and streets with less traffic load)

7.5.1. Characteristics of Jodhpur Park neighborhood residential streets

Some streets in Jodhpur Park are characterized by fewer traffic streets and provides better connectivity and shorter walking routes to the nearby commercial hub and marketplaces such as, Gariahat Market, Dhakuria, and Dakinapan Mall. There is a constant sensation of fatigue among pedestrian due to the lack of pedestrian infrastructure and sidewalks frequently occupied by vendors and other informal activities. The common modes of commute for nearby residents are usually three/two wheeler motorized vehicle. The markets places lack pedestrian connectivity. There is also limited physical and visual connection between the commercial hub and the neighboring open spaces and park areas, such as the Rabindra Sarobar Lake (a major park space, and recreation center in South Kolkata). Many commuters may remain uninformed of these public amenities in the area if they are commuting without a smartphone or knowhow about the place. In addition, the other issue that is of primary concern is the use of the inner roads by freight traffic for goods delivery to the nearby shopping locations increasing the risk of pedestrians and bicyclists.



Figure 32. Pictures showing narrow streets in Jodhpur Park neighborhood, with bicyclist, pedestrians and two wheelers.

7.5.1. Redesign Strategy [D] Reprogrammed as limited traffic streets with two way bike lanes

To combat the problems associated with the residential streets, certain inner streets are identified and reprogrammed as limited traffic streets with bike access. For these streets two- way bike lanes , limited traffic access, and limited hours of freight access are envisioned to allow people to walk and enjoy the streets more than a mere mundane activity. The improved pedestrian connectivity is expected to impact local businesses, improving their access way. The pedestrian streets are proposed to connect the market areas through inner street networks, creating active pedestrian loops. The proposed redesign strategies for intersections of pedestrian streets (limited traffic streets) with vehicular streets are suggested to have curb extensions, stop signs and speed humps to improve pedestrian safety. The proposal also suggests provisions to improve the wayfinding strategies within the inner road network with consistent signage, street names and directional guide Streetlights and street furnishing improvements are also vital along these streets to give a sense of place. The streetscapes are repurposed to house mobile vendor kiosks that are carefully designed for the purpose .Otherwise the vendors cluster around the primary road intersections and sidewalks creating unsafe environment for pedestrians. This measure, aims to distribute the

vendors over a larger area and reduce their concentration along major arterial roads. Integration of public art installation, street art, exhibitions, etc. along the streets are recommended to improve and reclaim the decaying character of the streets.

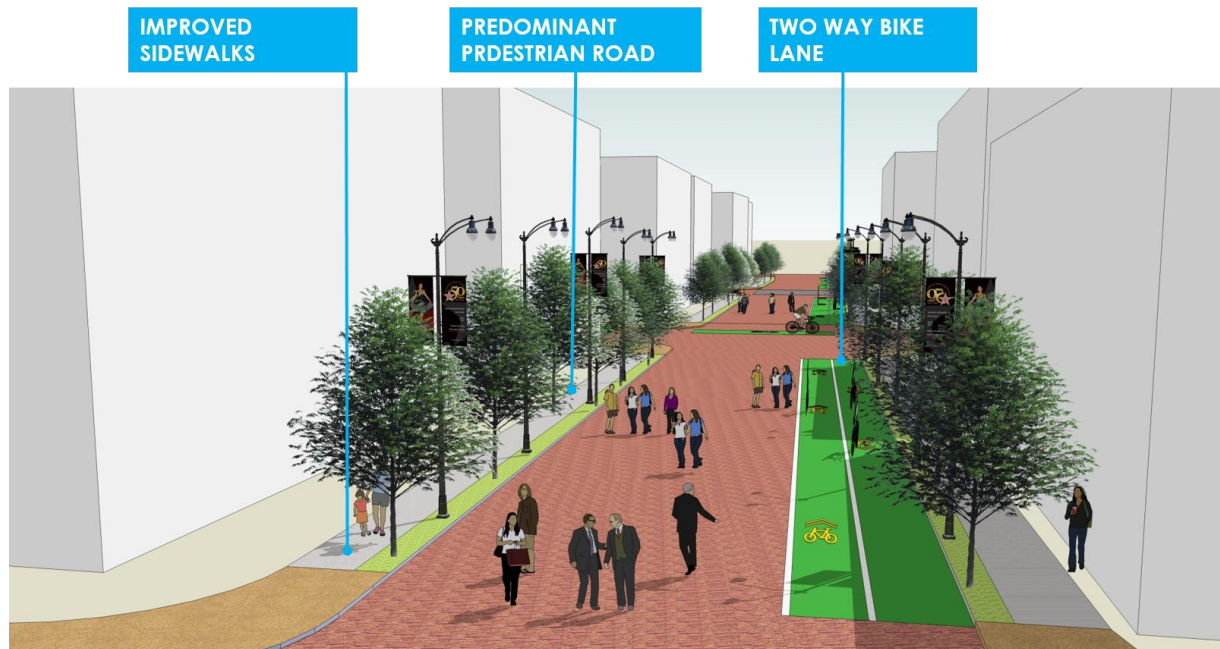


Figure 33. Redesign Strategy [D], Showing some streets in the neighborhood that are assigned limited traffic streets that would encourage people to walk and bike

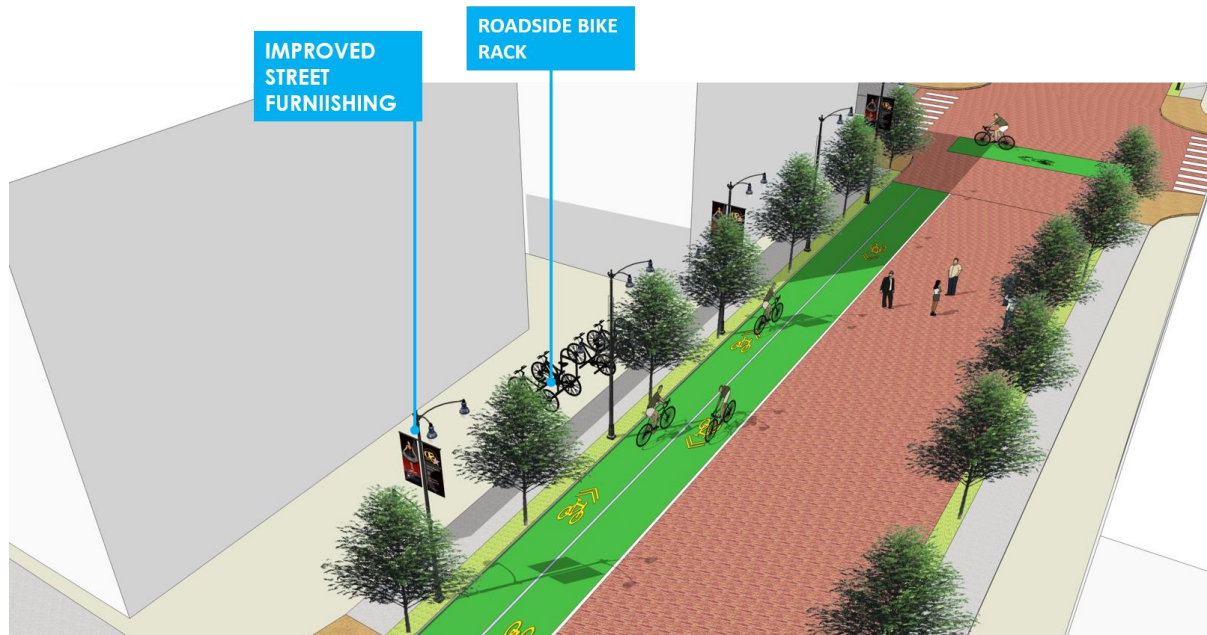


Figure 34. Redesign Strategy [D], Showing improved crossing for pedestrians and bicyclists, two- way bike lanes and bike share facilities

8. Conclusion

8.1 Limitations in implementing public realm changes in Indian cities

8.1.1. Design Challenges

Implementation of the design strategies suggested in this paper involves various public – private entities and stakeholders such as landowners, tenants, business owners, municipalities and developers. The change will interrupt the current pattern of land use. Incorporating bike lanes, widening sidewalks, as well as other design changes, would entail the integration of adjacent spaces that are either currently under- used or used for a different purpose. For example, the existing sidewalks do not have a uniform width, certain parts of the sidewalks are occupied by street vendors and temporary structures that are built without any appropriate permit from municipalities. Adding an extensive public right of way is a big challenge and needs support from owners of adjacent uses

Changes involve tightening existing vehicular lanes to fit non-motorized modes of travel. The current lane widths are not designed precisely with due consideration and preeminence to bicyclists. Conflicts are expected to arise with the existing driving regulations and attitude of drivers. Assigning certain streets as “limited traffic roads” can be difficult to implement. The statute aims to disallow traffic on certain roads except for resident traffic, necessitating change in driving pattern and following stringent rules for residents as well other user groups.

8.1.2. Politics

Political influence on development is a major concern for Indian cities. The multi-party political setting address immediate needs of residents, small and large business owners as well as other private stakeholders for their support. Changes involved in reclaiming public realm, are usually long-term comprehensive development process that risks interest of certain landowners, business owners, and stakeholders. They might seek for political support, and want the police power of the local administrative bodies to protect their interest and stop the development process. The idea of eminent domain and its significance in protecting public health, environment and overall quality of life is not a prevalent idea.in

Indian cities. Any regulatory taking for public benefit is seemingly unprotected by the legislature or administrative bodies

8.1.3. Economics

Public realm improvement in densely populated Indian cities causes displacement of people and businesses. Small, mid-size businesses have a hard time to relocate. Any development effort thus disrupts economic activity in the cities for a substantial period. In most cases the project budget is not enough to compensate the business owners. Although public realm development usually surges economic activity in the post-development phase yet, arranging the first cost of most development is challenging.

8.1.4. Public Acceptance

The long-term changes and ongoing construction work perturb the daily life of commuters. Road blockages and congestion are major issues with the high volume of traffic detour. The adjacent infrastructures are not adequate to support the excess traffic load. Also, residents and commuters are not oriented to accept the changes and understand the long term benefits. The road fatalities, congestion, and pollution, have engulfed public cognizance about roads in such a way that street improvements to facilitate bicyclists and pedestrians have become far-fetched ideas for public. Immediate acceptance of proposals for change is grim

8.2 Role of Planner

Reflecting on a variety of challenges and limitations in implementing public realm reclaim strategies, the role of planners becomes highly significant in paving the path to accommodate big ideas of change. Planners can act as mediators between different stakeholders, public-private organizations as well as people to bring about the change. Planners may initiate public engagement to share new ideas of public realm improvements, and spread awareness about the importance of public realm in improving the quality of urban environment²⁷, health and quotidian life quality. Framing the design guidelines and zoning laws, along with

²⁷ <http://www.grbj.com/articles/81496-dda-approves-funds-for-olds-manor-project>

creation of innovative strategies to incentivize the land or business owners to participate and co-operate with the change is vital.

Although limitations and challenges are manifold the big ideas of change is indispensable for cities to enjoy a clean environment and people to regain their active street life with a sense of place and safety This paper identifies the need for Indian cities to rise above the compromise of assigning primacy to automobiles on every road. The various examples, drawn from different urban contexts in the global scale, aims to act as an inspiration to give importance to the public realm. The global case studies together with the different design strategies to reprogram the study can guide the development process. Similar solutions and strategies can be applied to many more places in Indian cities. In addition, the proliferation of such ideas could lead to the adoption of specific criteria's in city ordinances. The notion of investments that emphasizes principles of Complete Streets and public realm enhancements can be translated into reality. By transforming the urban environment for alternative modes of travel, Indian cities can begin to get control of the pernicious effects of pollution, decrease congestion and improve human health to achieve a more equitable and attractive urban environment. The strategies for public realm improvement not only reduce global warming potential, dependence on fossil fuel, the burden of transportation cost but also, provide social cohesion through a public realm that the cities traditionally featured.

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